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THE AMERICAN
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VOL. 104 NOVEMBER, 1932 NO. 11

EDITORIALS

ON THE REVIEWING OF BOOKS

THE REVIEWING of books is an art not to be undertaken lightly nor to be indulged in by the incompetent. This is particularly true of works in the scientific field, whose reviews are too frequently the criteria whereby readers increase their working libraries. The utterly unjust criticism of a biased reviewer will often dissuade a reader from acquiring a book which might well have graced his library and improved his understanding. By the same token too, inspired propagandist reviews, originating with the publishers and printed, unchanged by lethargic editors, often bring to gullible readers the itch to buy—and a consequent disappointment. Fortunately the "inspection" privilege afforded to reputable persons in the business of buying books avoids many unbecoming purchases. There is upon the editorial desk, close by, a bound volume of the book reviews of that reviewer incomparable, Dr. Henry Leffmann, comprising all told some 300 pages.

And every review is a masterpiece. And every review is in itself readable and informative. One, in comment upon "The Subject Index of Periodicals 1917-19," starts with a couplet, written by Pope, in humorous mood:

> "How index learning turns no student pale
> But holds the eel of science by the tail."

Banal expressions, so characteristic of book notices, rarely found place in his paragraphs. "Satisfying a long-felt want,"—"should be on the shelf of every busy chemist" (on the shelf—*sic!*),—"the vade mecum of the practical man,"—were phrases for which he had little use.

He would have been particularly critical of such a statement as this, which appeared recently in a review of Kingzett's *Chemical Encyclopedia* (*Jour. Royal Soc. of Arts.*)

"No library in country or town house can afford to be without it —no boy should escape it as a Christmas present this year."

One would suspect that it had to do with a bicycle.

But where he could with value insert a rare quotation or a bit of fitting verse he did so, and thereby livened his written opinions.

And above all he was accurate in his findings and bias never wittingly dictated his decisions. Would that all reviewers exercised his technic.

A writer in *The Chemist* * has given us a most *sour-castic* or *sarcaustic* article, containing a "compleat discription of the fine art of rendering book reviews." It is herewith printed in its entirety—and it is well worth the reading—not so much with a view of accepting its ministry, but at least for the purpose of exciting our risibilities, and to compel an admiration of the gift of observation and expression in the writer.

"The art of book reviewing has fallen upon degenerate days. Only rarely do we discover a reviewer of originality, independence, and keenness, who can judge a work according to the highest classical standards. Much of what passes for literary criticism is merely inept adulation or sales promotion. To assist in remedying this deplorable condition we have drawn up a set of rules for the guidance of those who would review books. These rules are the result of long experience and are of the highest authority. They should never be departed from except in the gravest emergencies.

First, don't read the book. If you do you may discover something to praise or something that may influence your judgment.

Remember that the author is a reprehensible scoundrel who has committed an unforgivable crime in daring to publish a book.

You are perfectly secure in being as offensive as you like. The author cannot retaliate.

Do not make the mistake of thinking that book reviews are intended to convey any information concerning the publication being dissected. The reading public regards them simply as *jeux d'esprit*, to exhibit the cleverness of the writer.

* A publication of the American Institute of Chemists.

Praise nothing, not even the author's use of good English. To do so will be considered evidence of feeble-mindedness.

Ferret out every misprint and expose it in scathing terms. The author will be eternally obliged for the corrections.

If the author is humorous, condemn his frivolity; if he is serious, denounce his conceited dogmatism.

Garble the text. Pick statements out of their matrices and combine them to make ridiculous nonsense. The more expert you are at reviewing, the more skillful you will be at this entertaining diversion.

If you cannot discover an obviously erroneous assertion refer to some statement in such a way as to imply absurdity. For instance, if the author says the sun rises in the East, remark that the "writer appears to have peculiar notions about the motion of celestial bodies." This always is highly appreciated.

If you cannot expose specific faults, talk in general terms. Your reader will admire your profundity and doesn't want to know anything about the book anyway.

Dip your pen in 30 per cent. fuming sulphuric acid. Ordinary vitriol is much too weak for your purposes.

Never lose sight of the fact that, in demolishing the hopes and aspirations of the author, you are performing a public service. If no one should discourage book-making, consider what a flood of worthless literature would inundate the land!

Always assume an oracular authority, as if the concentrated wisdom of the ages were concentrated in your intellect. Deliver your denunciations with a ponderous and dignified gravity. The reader grovels before dogmatic sarcasm. And the author hasn't any friends, anyhow.

However—a word of caution. If the author is a successful and famous personage, whether he writes classics or drivel, throw all these rules away and prostrating yourself before him, lick his boots. Praise his inanities, enthuse over his platitudes, quote his banalities as the insight of genius. You will not deceive the reading public, which never fails to appraise you at your proper value."

Accordingly so, be it *not* done!

IVOR GRIFFITH.

THE PRICE OF A PRESCRIPTION

THE BELIEF that the druggist's profit on the preparation of prescriptions is enormous is widespread. The layman and the jokesmith are fond of continuously repeating the charge. One tale-bearer put it: "The druggist fills a little bottle with water, colors it red, and charges you a dollar for it."

Unfortunately, many of the members of the medical profession do not help to refute this sort of slander. A very influential citizen, with professional attainments, recently gave it as his opinion that the high charges made by druggists for putting up prescriptions had much to do with the high cost of getting well, and that in these times this was a factor in prolonging the depression.

The insistance of an overcharge in this case led to an investigation. A copy of the prescription was obtained, and the aid of experts familiar with the cost of drugs was invoked. The prescription called for the modern antipyretics, some of which are high priced, to be mixed and put into eighteen capsules. The experts estimated the cost of the drugs, plus the cost of the empty capsules, the box, label and wrapper, to be forty-seven cents. The general or overhead charges in conducting a drug store have been agreed to be twenty-eight per cent. This charge added to the cost of the ingredients in this prescription makes the cost of the prescription as delivered to the patient sixty-eight cents, and for it the druggist received seventy-five cents. The druggist's net profit was about seven cents, or slightly over nine per cent.

Against the apparent net profit of seven cents on this prescription, there might be added a cost for special equipment, skill, and a possible charge for loss through carrying the stock of the slow-selling drugs which it contained.

The druggist's profit on this particular prescription was evidently nil, and, in addition, he received a sinister reputation for overcharging.

Why is it that the public is quite unnecessarily imbued with the idea that the prices charged by druggists for compounding prescriptions are exorbitant? The plumber makes a high charge for stopping a leak, and his patron smiles. The restaurant keeper makes a cover charge of two dollars, puts on the bill an exorbitant charge for a steak, to which are added extras, tips, etc., and everybody is happy. It is acknowledged that the wares of the patent medicine maker are sold at a price of from two to three hundred per cent. above the cost of the

ingredients. In these transactions the consumer—the buyer—has been led to believe that he is getting the worth of his money, and he makes no complaint.

But when the customer is handed a box holding a few pills, or a small vial containing what he considers only colored water—whatever the price be, he thinks that he is being overcharged. Unintentionally, he is often misinformed by the prescribing doctor, who carelessly names a ridiculously low price as the proper one to pay. The situation is further complicated by the fact that the dispensing physician ordinarily makes no charge for the drugs which he dispenses, and the patient thinks that they must be cheap.

The ancient apothecary made no charge for the drugs which he dispensed, but he obtained a goodly fee for the incantations and ejaculations which he uttered in preparing and dispensing them.

The preparing and dispensing of a prescription must be accompanied by good salesmanship. Handing it over the counter with a simple "Thank you" falls far short of this. The invitation to "call again" is quite out of place, as the customer is inwardly hoping that the medicine will cure him and that he will not need to "call again."

In a store where prescriptions are dispensed the whole atmosphere should be filled with pharmacy. Customers should be made to see and know that it is a pharmacy. There are cases of successful, shrewd pharmacists who make it a special point to show physicians, heads of families and others, their facilities for the handling and dispensing of drugs.

The delivery of the prescription should be accompanied by words that will inspire confidence. The buyer of a prescription should be convinced that the drugs therein have been selected, tested, and prepared for his especial purpose; that the compounding has been carried out by dispensers carefully trained and with the highest skill known to the art of pharmacy. As one writer phrases it: "Into the package should be wrapped the spirit and soul of pharmacy." A message inspiring confidence, hope and cheer should go out to the user of the medicine. A woman lying on a sick bed was handed a package of medicine. She looked at it and exclaimed: "Ah! This comes from Blank's Pharmacy. I shall label it 'faith,' for I know that it will cure me."

Statistics show that there are 165,000,000 prescriptions dispensed annually in this land. Some pharmacists dispense as few as one a day.

Others dispense fifty a day. And there are pharmacists who dispense five times this number.

Profitable sales of sick room and home needs supplies accompany the prescription business.

The prescription business builds a permanent prestige and goodwill for a store.

There should be no "cut rate" for a prescription.

A prescription will bring a good price and profit when dispensed under the halo of pharmacy.

FRED B. KILMER.

ORIGIN OF THE SHOW GLOBE—HOW AND WHEN

The origin of the pharmacist's show globe is largely a matter of speculation, for their beginning is more or less lost in obscurity. It must be borne in mind, first of all, that the idea of the display bottle in windows is not limited exclusively to drug stores. There is, for instance, the Golden bottle of the bankers and goldsmiths. Various types of bottles have likewise been featured in tavern fronts. There is, however, something quite distinct and unique about the show globes of the pharmacist.

As to the speculations set forth concerning their origin, the most likely one is that the idea originated through the fact that during the early part of the nineteenth century, the pharmacist macerated various powdered drugs, preparatory to the percolation process, in large jars placed in the windows of the drug store. It was understood in those days that sunlight served in a beneficial role not only in a better extraction, but in extracting the desirable constituents of the drug or drugs in question. Many of these drugs macerated in this manner, contained various coloring principles that would dissolve in the liquid used for maceration purposes. After the drug settled to the bottom of the jar, the liquid above or the supernatant liquid would frequently be highly colored.

As to the date when show globes were first employed by pharmacists, this is also a disputed question. One authority places the date at 1665, the time of the Great White Plague, adopted at that time so as to enable those seeking remedial agents to better locate the shop of the Apothecary. Still another authority places the date at 1617, in which year the apothecaries of England became distinguished as a class from the grocers.

A. H.

SELECTED EDITORIAL

"BAD DRUGS AND THE LAW" *

UNDER the title "Bad Drugs and the Law," Arthur Kallet and F. J. Schlink in the *Nation* for October 19th consider three subjects —"Ergot," "Ether" and "Prescriptions." The article on ergot opens with this statement:

> "For an extra profit of half a cent, American drug manufacturers have helped dig the graves of thousands of women dead of hemorrhage in childbirth."

Possibly—but not probably—more fantastic falsehoods have appeared in reputable magazines than the one just quoted. Kallet and Schlink, who should know better, have apparently swallowed, hook, line and sinker, the preposterous and fantastic publicity which the Ambruster clique has been trying to get into newspapers and magazines for several years. It will be remembered that Ambruster owned some Spanish ergot and became considerably worked up because of difficulties in advertising and selling it. This entire matter was discussed in detail in a special article published in THE JOURNAL, September 6, 1930, entitled "Ambruster, Rusby—and Ergot."

In opening their paragraph on ether, Kallet and Schlink say:

> "Next to its toleration of sub-standard ergot, we know of no more inexcusable and intolerable abuse of public confidence than the negligence and callousness that have characterized the administration's handling of the problem of impure ether sold to hospitals for anesthetic use."

This statement is just as ridiculous as the one on ergot. These gentlemen fail to support their charges with any good evidence that any patient has been harmed through the administration of substandard ether. Any competent physician or anesthetist can tell when a patient is anesthetized, and medical literature supplies few if any established cases of poisoning by impure ether.

On the subject of "Prescriptions," Kallet and Schlink state, in effect, that because of the small number of prescriptions that many druggists have to fill, drugs that deteriorate by keeping are used "month

* Reprinted from *Jour. Amer. Med. Assoc.*, 99, 18, p. 1513.

after month, even for years, until the last dead drop is gone." They state, further, that "a large percentage of prescription compounds, including both those prepared by the druggist himself and those purchased from drug houses, depart from the legal standards set in the United States Pharmacopeia and the Formulary." They state, also, by implication, that probably more than two-thirds of the prescriptions that are compounded throughout the United States are "improperly filled or filled with weak drugs, or drugs of excess potency." However, Kallet and Schlink do not blame the individual druggist for this state of affairs but do blame the "drug and prescription dispensing system which mixes a minor profession with a major business."

That substandard drugs have occasionally been sold and are being sold is doubtless true; probably it will continue to be true, in spite of all that officials may do to the contrary. Most Americans are familiar with the practical impossibility of enforcing laws in regard to one single drug, alcohol, notwithstanding the enormously expensive machinery that has been set up for the purpose. How, then, may the officials whose duty it is to enforce the Food and Drugs Act be expected to guarantee the enforcement of the law on the thousands of other drugs, with an insignificant machinery and relatively microscopic budgets? Our food and drug officials appear to have taken uniformly the one practical method of minimizing such evils, namely, by securing the co-operation of the manufacturers and dealers themselves. Druggists and drug manufacturers, on the whole, are not recruited from the criminal population but are respectable people who generally try to do right and will avoid wrong if it is pointed out to them.

"Substandard" drugs do not necessarily mean deliberate adulteration; drugs are subject to deterioration, variations of crude supply, and similar influences. Much more can be accomplished by finding means to correct the underlying causes than by attempting the quite impossible plan of having the government check every retail sale at every drug store. Fortunately, the great majority of the departures from the official standards are not of such a degree or kind that they menace the health of the purchaser. Any that might be dangerous doubtless call forth direct action by the Food and Drug Administration as soon as they are discovered. The psychology of fear and alarm which the authors of this article try to engender is quite unjustified and altogether reprehensible. Mr. Schlink, of Consumers Re-

search, Inc., knows better and should not have let himself into sponsoring such an article.

NOTE: The Editor of the *Journal of the American Medical Association* has exercised much tact and altogether too much kindness toward these men whose vicious writings conceal from the unknowing, but reveal to the informed their utter ignorance of the actual state of things. That "Consumers Research Inc.," in the past affording a fairly reliable service, should so dumbly succumb to misinformation, brands it as an agency to be watched for further evidence of decomposition.—*I. G.*

ACRIFLAVINE EMULSION—This preparation is frequently prescribed, and several methods are used in its compounding. In the "Extra Pharmacopœia" a formula is given using alcohol and wax, but it has not always given satisfactory results. In consequence other means have been tried of obtaining a preparation that is sterile and non-separable, and the following formula is suggested:—

Acriflavine	0.5 gm.
Warm boiled distilled water	25 mil.
Wool fat	30 gm.
Liquid paraffin	to 500 mil.

Dissolve the acriflavine in the water. Sterilise the wool fat by heat, allow to cool, and pour it into a sterile mortar. Add the acriflavine solution, little by little, thoroughly incorporating each portion before making a further addition of the solution, much in the same way as when making an oil emulsion with acacia mucilage. Sterilised liquid paraffin is now added, stirring well, and the product made up to volume.—*W. J. Clarke, Phar. Jour.*

ORIGINAL ARTICLES

SELECTION OF PROPRIETARY VERSUS NONPROPRIETARY DRUGS IN HOSPITAL PRESCRIBING*

By Ernest E. Irons, M. D.
Chicago

THE GROWTH of hospitals in number and in efficiency is one of the striking medical changes of the past twenty years. They have been equipped with modern operating rooms and X-ray, chemical and pathologic laboratories, and through their staffs are exerting a tremendous educational influence on the public. They are participating in the medical education of their interns and of their own staffs, who by study and contact with one another grow in experience and skill.

But the hospital drug room, which reflects directly the medicinal requests of the staff, has hardly kept pace with the modernization of other departments of the hospital. The shelves in some hospital pharmacies remind one of the exhibits of proprietary medicines in a chain-drug-soda-fountain-lunchroom. It will be of some interest to inquire why in some hospitals there should be so many proprietary drugs and mixtures prescribed, where of all places conditions for the prescribing of the simple standard remedies needed by the patient should be ideal.

Perhaps the first and obvious reason is that no one, except possibly the hospital pharmacist, has given the matter much thought. The physician prescribes a drug under the name he remembers best, and frequently drugs continue to be prescribed under their proprietary names long after pharmacopœial preparations have become available. Many of us remember methenamine, long used as a urinary antiseptic, better under one of its many proprietary aliases such as urotropin. In other instances, manufacturers give a proprietary name to simple pharmacopœial drugs or mixtures of them and by insistent advertising, with startling claims, increase for a time the use of these preparations. The advertising value of a catchy name has the same force in medicine as in commerce.

*Read before the Annual Congress on Medical Education, Medical Licensure and Hospitals, in 1930 and more pertinent now than then!

We too frequently think in terms of disease names and medicines instead of in terms of pathologic physiology and the remedies which may promote the return to normal function. The correction of disturbed function usually calls for one remedy, and, if but one is required, the inclusion of others is unnecessary. Proprietary mixtures are needlessly complex, and, if the patient requires a certain remedy, it is hardly fair to burden him thoughtlessly with a lot of other things he does not need. In case the administration of combinations of drugs is desired, these may be made up from single doses in the hospital stock or prepared in the hospital pharmacy to meet the needs of each special case.

The Dangers of Proprietary Prescribing

The evils of proprietary prescribing arise not from the mere fact of the sale of a drug under a proprietary name but from the circumstances attendant on its distribution and its popularization under claims misleading alike to physician and to patient, which lead to its use in ways directly harmful to the user. The manufacturer who by real research discovers a new and efficient remedy is entitled to the adequate commercial reward insured by the use of a proprietary name. This principle is recognized by the Council on Pharmacy and Chemistry of the American Medical Association, and worthy original products are recognized under coined names. The Council has rightly held, however, that the name should reflect the composition of the product and not the clinical use to which it is put.

Besides the frequency with which proprietary remedies are advertised under unwarranted and misleading claims, other objections to their use are the added expense in their purchase, which is passed on to the ultimate consumer, the patient, and the tendency of their use to increase self-medication, a practice that leads often to serious harm to the patient. A recent instance of the harm that may result from unsupervised self-medication is furnished by cinchophen, one of the newer drugs used in arthritis and other conditions, in part for its analgesic action, and extensively advertised under proprietary names as well. When used in small doses for short periods it appears to be safe, but in a number of cases fatal injury to the liver, with symptoms resembling acute yellow atrophy, has resulted in patients who on their own responsibility have taken large doses over long periods. The danger to the public of self-medication, which begins through the prescribing for patients of proprietaries by physicians and interns in

hospitals, is serious and calls for a careful review of habits of prescribing by the attending staffs.

The more vicious opium-containing "patent medicines" have largely disappeared, but occasionally, even now, an opiate-containing proprietary appears under an entirely uninforming name and for a time gains access to the hospital pharmacy. Some remedies, such as theobromine sodiosalicylate, widely advertised years ago as diuretin, are now occasionally prescribed under their proprietary names because physicians forget for the moment their real composition.

Styles change but competition remains. Just now a number of drug houses are interested in the production of hypnotics of the barbital group, each manufacturer vying with the others in attempts to produce a new modification, for which claims of superiority may be made. These hynotics in general differ little from one another but add materially to the length and expense of the drug list of the hospital pharmacy. Less creditable still is the practice of combining two drugs in fixed proportions in a mixture which is given still another name, and sold with claims of doubtful credibility.

Mixtures of a hypnotic and an analgesic—under a proprietary name generally uninforming—have been foisted on the medical public, thereby hindering the advancement of rational therapy. These preparations are generally marketed by firms who desire the confidence of the medical profession but who, on the other hand, find it "good business," commercially speaking, to exploit these preparations of active ingredients in fixed proportions not only to physicians but sometimes directly to the public. If it is found desirable for the sake of convenience to furnish a combination of two drugs in fixed proportions, then the name should give full information as to the ingredients and the dosage of each.

Hospitals have contributed much to advances in therapy by furnishing controlled conditions under which new remedies can be studied and methods of their use improved. The methods of use of insulin and of liver extracts for pernicious anemia were thus developed much more rapidly and safely than could have been the case without the cooperation of hospitals. New and worthy drugs whose composition, action and safety have been determined are given further study in hospitals, where their action and limitations can be easily observed, with the result that new and proved remedies are made available to the public.

It sometimes happens, however, that new drugs are offered to physicians and hospitals supposedly for clinical tests, while the real object is to popularize a partly tried drug, or an old drug under a new name. This is not an experimental test of the drug by the physician but an experiment of the manufacturer to see how long it will take the physician to acquire the habit of prescribing it.

In many hospital pharmacies there will be found a drawer in which are collected odds and ends for which there is no longer an active demand but which the thrifty pharmacist hesitates to discard. Here in this pharmaceutic morgue repose the remains of formerly prosperous proprietaries, whose vogue ceased with the termination of advertising. Some survived longer than others, but they either have been found to be useless or have been replaced by pharmacopœial preparations of known composition.

Hospitals have an educational responsibility to their interns and to the public. If members of the hospital staff prescribe proprietary drugs when pharmacopœial drugs are available, their interns are likely also to acquire the habit of prescribing proprietaries. Example is a great teacher, and interns soon come not only to take histories and examine patients but also even to walk and talk and prescribe like their chiefs. Patients who are given proprietaries in the hospital soon learn to use them on their own initiative, and the unfortunate outcomes of self-medication result.

A certain responsibility for proper prescribing lies with the intern himself. While he is still technically a student, he is a mature man of an average age of twenty-seven years and has received his instruction in a good medical school. He must accept some responsibility for the proper treatment of the patients in his charge, and to the extent that he hopes later to rise in his profession he should learn to think for himself and prescribe those remedies whose composition and action he knows.

Superintendents and boards of trustees of hospitals will find much to interest them in the invoices and inventories of the drug room. In those hospitals in which all drugs are supplied gratis, considerable sums may be saved to the hospital and where the cost of drugs is added to the hospital bill a material saving in the cost to the patient of hospital care may be made by seeing to it that widely advertised and often expensive proprietaries are not allowed to displace equally effective and often identical official products.

Hospital Manuals

Hospitals must have rules of procedure for the guidance of interns, and in many instances these are printed in a small manual to which are sometimes added brief formularies including, in addition to standard drugs and their doses, certain formulas that have been traditionally used in the hospital.

Some hospital handbooks are excellent and are extremely valuable to interns in aiding them to form good habits of prescribing, as well as in providing information in emergencies. Others of these manuals are likely to exert a pernicious influence, as in the case of one which includes in its formulary a number of proprietary mixtures and appears to have been written by the detail man rather than by the well-informed staff of the hospital. A reading of this particular handbook leads one to doubt whether it has ever been submitted to the staff for approval.

Several manuals on therapeutic subjects are published by the American Medical Association under the direction of the Council on Pharmacy and Chemistry, and include New and Non-official Remedies, Useful Drugs, and an Epitome of the Pharmacopœia, as well as an annual report in which are summarized the proceedings of the Council in its investigations of drugs and remedies promoted under false and unwarranted claims.

The publication of a hospital manual with standard hospital rules and formulary, suitably interleaved for the insertion of special rules and formulas desired by each individual hospital, offers one way in which all interns may be furnished at small cost with helpful authoritative information approved by the hospital staff.

Cooperation With Hospital Pharmacist

Inspection and study of the hospital drug room will be of interest and profit alike to the administrative and the professional members of the hospital staff. The superintendent will find here opportunities for justifiable economies the existence of which he had not suspected. Attending physicians will be surprised at the large amounts of proprietary drugs which they are unthinkingly using in place of equally effective and less expensive pharmacopœial preparations, often under the misapprehension that the widely advertised proprietaries were accomplishing something more than the practically identical official drugs.

A closer acquaintance and cooperation between the hospital pharmacist and the members of the attending staff will be of mutual profit. The pharmacist will learn the problems which the staff has to meet, and the physicians can learn much concerning the composition and origin of new as well as of old remedies. In many hospitals the staff has failed to avail itself of the store of pharmaceutic information which may be had from the pharmacist for the asking, and the pharmacist has not taken as large a place in hospital conferences as he should. His function should not cease with the supplying of drugs called for on prescription and the detecting of inadvertent errors of dosage, but properly should be extended in an informative and advisory capacity, under instructions given by the staff and medical superintendent, so that hospital prescribing may be limited to remedies whose composition is known and whose use is approved by the best medical practice.

The correction of habits of prescribing proprietary drugs in hospitals will go far toward eliminating confusion and improving the medical education of interns, nurses, the public and the attending physicians themselves.

Eugene A. Rau, Bethlehem, Deceased

Dr. Eugene Abraham Rau, eighty-four, Bethlehem pharmacist and nationally prominent for his development of the pharmaceutical and botanical sciences, died at his home October 18th, after a brief illness.

For many years he conducted the drug business of Simon Rau & Co., of Bethlehem, said to be the oldest store of its kind in this country, having been founded in 1752, and still doing business under the firm name of Simon Rau & Co.

Dr. Rau * was an authority in the field of botany and had established a herbarium, its principal contents being mosses of varieties native to this country and probably the most complete in this field in existence. He deposited this collection in the Museum of Natural History in New York City. He was active in the governing bodies of the Moravian Church and a trustee of Moravian Seminary and College for Women.

* See article "A Paradise Found," This Journal 96, 9 (1924), pp. 667-674.

THE PHOTOMICROGRAPHY OF BACTERIA

By Herbert Bohn, M. Sc., B. Sc., Ph. C.

MODERN research in biology and the medical sciences is becoming more and more dependent upon the skill of the photomicrographer. He records upon a specially sensitized plate or film what the eye cannot detect. Let us examine the instruments with which the photomicrographer works.

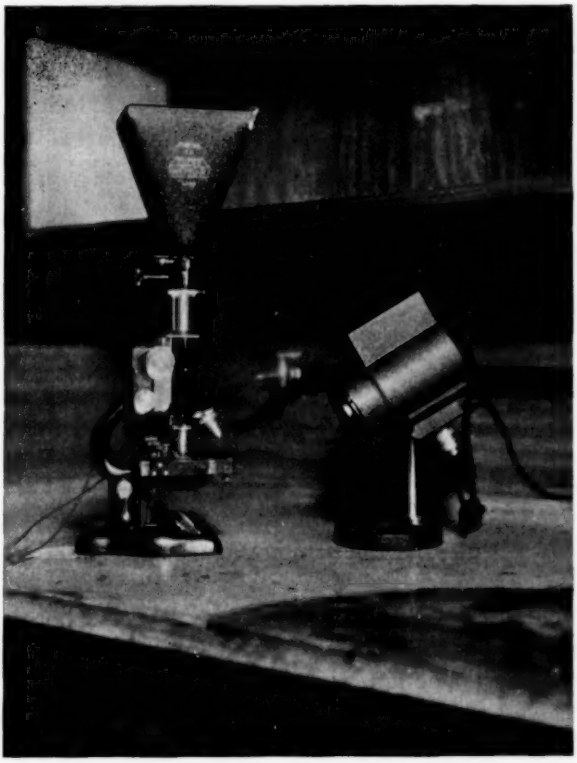
THE CAMERA

The apparatus with which he works is highly developed. Among the apparatus the camera known as the photomicrographic camera is the most important instrument. This camera is made in various types, built up with a considerable degree of refinement to meet the requirements of specialized work. It can be had in either the bellows type or fixed projection chamber type. The bellows type takes a large picture, five inches in diameter, on a five by seven inch plate and requires the use of an arc light of at least twelve amperes for best results. Both cameras are so constructed that they can be used in a horizontal or vertical position.

The camera with fixed projection chamber is to be preferred in photomicrography of bacteria due to the facility with which it may be manipulated. It is equipped with an observation eyepiece which makes it possible to view the object up to the very moment of exposure. This is particularly valuable in photographing hanging drop slides for colloidal investigation and the study of motile microorganisms. This camera takes pictures 3¼ by 4¼ inches, a most convenient size, does not necessarily require the use of an arc light and gives very fine definition with the use of a tungsten filament lamp. It has high optical precision and remarkable depth of focus. This is very useful to the bacteriologist and microscopist because it faithfully records for him the morphological characteristics of bacteria, with a degree of definition, which will admit of good projection or reproduction. This camera can be readily dismounted and replaced without readjustment. It does not require involved calculations to find a given magnification, this being available by the simple multiplication of two factors, namely, the magnification of the eyepiece by the magnification of the objective. The difficulty of making new and complicated calculations when using the bellows type for every desired magnification, has now been overcome by the preparation of standardized tables, with which it is also possible to get the desired result by multiplication of two numbers. These tables were originally worked out by Pro-

fessor Petrunkevitch of Yale University. It may be noted that the cost of both types of camera is about the same.

In recent years the moving picture camera has been widened to the photomicrography of motile microorganisms. This of course requires additional accessories, which tends to make the whole apparatus complicated and almost too costly for the private research worker. A few research workers have been able to do some work with the ordinary movie camera, but for most work, especially work which requires a prolonged period of time, a specially built camera with timed motor-driven film exposure is necessary. On these cameras the speed can be regulated by a system of gears; and even "time-lapse" photography can be arranged, which guarantees an even run of film exposure, where a long period of exposure may be required. The motor is an



Courtesy Bausch & Lomb Optical Co.

Fig. 1—Showing Compact Arrangement of Photomicrographic Camera, Microscope and Lamp.

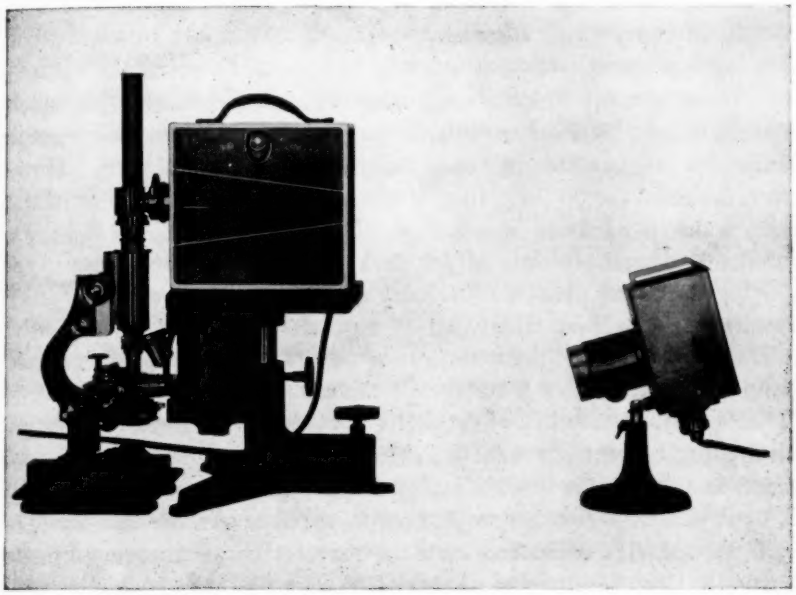
electric induction motor of the usual clock type operating on the sixty cycle alternating current and built heavily enough to drive the film. One of the first requisites in taking moving pictures is that the camera should be rigid. The special cameras are so built. In taking moving pictures of motile organisms it is desirable that the photographer focus and manipulate the microscope so as to choose the proper field while photographing. To accomplish this there has been devised what is called in optics a "beam splitter." This makes it possible to use about ten per cent. of light through the eyepiece, leaving ninety per cent. to be reflected on the film in the camera. A carefully controlled pencil of light emerging from the high-power objective into the cine-recording apparatus yields favorable results even to a beginner. This particular optical combination gives best results in conjunction with a dark field. Motion pictures of living organisms are best accomplished with the use of a light blue filter and the dark field. The "beam splitter" is now an indispensable piece of scientific equipment for studying living material unstained and in its natural environment and lends itself unusually well to research biology. With it one is at once at the threshold of the living cell; and the permanent film record provides a means of filing valuable work which at some later time may be re-examined, as additional information accumulates upon a given experiment.

SMALL CAMERAS

Employment of small cameras fitted with one of the motion picture anastigmats of either 25 mm. or 50 mm. focal length over the eyepiece is practiced by some workers. This depends upon the fact that the normal human eye is an anastigmat of short focal length. Standard motion picture lenses are 25 mm. focal length as compared with the average human eye, which is about 23 mm. Advantage of this fact is taken when one focuses the microscope to accommodate his vision, employs such small cameras fitted with one of the motion picture anastigmats above mentioned over the eyepiece and then makes an exposure. The latter is determined by trial. The result will be a very clear photomicrograph provided of course the objects are not too small, as for example, when handling bacteria. The latter cannot be satisfactorily photographed by this method, as the resulting image will be too minute for a satisfactory enlargement. A different technique must be employed. This method lends itself well only to the microphotography of crystals and when using the petrographic microscope.

PHOTOMICROGRAPHIC MICROSCOPE

In addition to the cameras above described, there is now to be had a photomicrographic microscope which is superior in many ways to the photomicrographic camera. This instrument equipped with an observation eyepiece and especially built to cover a large field of application is, however, very costly. It can be used directly for projection or by application of a mirror, it can also be used for drawing. The image is thrown on paper considerably enlarged and may thus be easily traced.



Courtesy Bausch & Lomb Optical Co.

Fig. 2—Cine-Photomicrographic Outfit With D. D. S. Microscope.

LIGHT SOURCE

Three kinds of light are used for photomicrographic work, namely:

1. White or ordinary artificial light and infrequently sunlight.
   a. Carbon arc lamp.
   b. Tungsten ribbon lamps, required for cine-photomicrography.
   c. Concentrated filament lamps of clear glass with thick or wide filament.

The regular projection lamps used in home movie outfits are satisfactory. Two types of lamps may be considered.

(1) 100 Watt—115 Volt Projection Mazda.

(2) 160 Watt—115 Volt Projection Mazda.

Automobile lamps are also a source of satisfactory illumination.

2. Infra-red light.

3. Ultra-violet light.

   a. Iron-arc.

   b. Mercury Quartz burner.

Unsatisfactory lighting can account for insufficient contrast which may be caused by an unnecessarily large aperature in the microscope lamp or a larger condenser stop than the objective will bear. However, the main factor for getting the proper contrast is the color of the light which is used for illumination. The electric arc gives the most intense light and is required for dark field work. For research requiring the finest detail the mercury quartz burner gives noteworthy results and is indispensable where the greatest resolving power of the microscope is desired. There is now on the market a small iron-arc lamp which fits under the stage of the microscope. It gives a very reliable source of ultra-violet light provided a constant source of alternating current is available so that no flicker in the light will take place, as the latter is unsatisfactory to good photography. This lamp is equipped with suitable resistances to partly overcome this trouble. It is inexpensive compared with the more elaborate mercury quartz burner. Best results for all photomicrography are obtained with monochromatic light. Illuminating units are on the market, built with housing, heavy supports for rigidity, necessary adjustments for accurate centering and focusing the light onto the mirror of the microscope.

LIGHT AND COLOR

An extensive amount of research work has been done that the photomicrographer may control the color of the light which he finds necessary to use in the specialized work he is called upon to do. This has resulted in the development of what is known as the Wratten filters and by emulsions on plates and films treated with organic dyes which act as color screens.

There are now available a large amount of different kinds of Wratten filters. Their values are finely graduated. Some of them give exact wave lengths of light. A set of nine well-chosen filters is all that is required for most research work in bacteriology, since combinations with these filters can be made thus greatly extending their usefulness. These filters may be had in circular discs to fit the substage condenser. The most useful filters are the Wratten K-1, K-2 and K-3, yellow filters of various intensity. Plates are made with eosin treated emulsions, with which it is possible to make instantaneous exposures in ordinary or white light without the use of filters. Ordinary or white light contains red, green and blue-violet, and is therefore polychromatic. The greatest amount of photomicrographic work is done with filters which enables one to control the light and the degree of contrast. The use of filters and combinations of them is a complicated process and varies considerably with different cases. The best way to determine the kind of filters or combination of them to employ is by a trial of visual inspection of the objects that lie in their path. Similarly exposure time may be determined through trial by exposing successive areas of film or plates for different periods of time. Working with the phenomenon of bacteriophage in action the writer has been able to obtain greater resolution with pure red light, using a Wratten F filter. It transmits a wave length of about 6, 100 Ängstrom units. This filter causes considerable eyestrain and should be used for short intervals. For the purpose of photomicrography a special plate is available, the Wratten and Wainwright Panchromatic *M* plate designed exclusively for this purpose. The speed is not excessive slightly more than 19 deg. Scheiner. It is particularly sensitive in the ultra-violet and infra-red regions. The plate should be developed in total darkness. If a little light is required the Hubl-Naphthol green light will prove to be entirely satisfactory. One is rather inclined to overdevelop these plates and it is much safer to underdevelop. The time and temperature method is the most satisfactory one of development, especially where important work is involved. When using this plate for the first time it is well to experiment with it using a Wratten K-1 filter (very light yellow). DuPont yellow cellophane may be substituted. The number of plate and film materials at all usable in this branch of science are few. Following are other plates and film that may be used for photomicrography of various requirements:

Supersensitive Cine-Panchromatic Film.
Supersensitive Panchromatic Cut Film.
Agfa Chromo-Isolar Plate.
Agfa-Iso-Rapid.
Eastman Ortho Plate.
Eastman D. C. Ortho.

Studies with polarized light yield satisfactory results with the Agfa color plate, the Lumiere Autochrome plate, and with more recent Finlay process for instantaneous color photography.

DEVELOPMENT OF PLATES AND FILM

As to developing the resulting negatives obtained from various exposures, I have found the ordinary developers of little or no use. The Agfa fine grain developer number twelve emphasizes the fine grain feature in a direction too far to obtain a clear photomicrograph. The well-known Metol-Hydroquinone, also known as M-Q developer is not to be recommended for high grade work. If it is used at all it should be used quite cold between 40-60 degrees F. Rodinal and Rytol are satisfactory developers and the resulting photomicrograph has good contrast and definition. The only formulas to be recommended are those using glycin or amino-acetic acid in the developer. It possesses fine grain and the degree of contrast may be controlled. This is the only developer to be used by the bacteriologist and microscopist who wishes detail to his work, a feature so necessary to the exact work.

Philadelphia College of Pharmacy and Science,
Philadelphia, Pa.

IDENTIFICATION OF BLOOD OF MAN—Dr. Keno Kaji of the legal medicine department of the Tokyo Imperial University has found a method of differentiating human blood from that of other animals. In his new method, he extracts the hemoglobin and injects it into a rabbit, the serum of which will make a milky deposit in human blood serum, while other human albumin, such as pus or nasal mucus, never shows such a phenomenon. Further, animal albumin, such as the hemoglobin of a horse, cow or dog, also remains transparent when it is put in this serum.—*J. A. M. A.*, 99, 17, p. 1443.

MANUFACTURED ICE CREAM

By David Wilbur Horn, Ph. D.

"SCIENCE is the base upon which is reared the civilization of today." These words of Herbert Hoover will be well illustrated in our consideration of the subject for this evening,—the consideration of a *food,* ice cream.

Anyone who may question the appropriateness of this quotation in this connection, need merely reflect for a moment upon the stern reality of some of the relations between food and civilization. In a crucial experiment I think you could destroy a civilization promptly, that is, with surprising rapidity, by merely attempting to deprive it of food. Reversion to fundamentals would set in at once; robbery, murder, cannibalism, and, in a word, anarchy would result. The mentally honest admit today that the current attempt at a sudden and complete deprivation of drink, for which the appetite is certainly less generally distributed and developed than the appetite for food, has produced conspiracy, robbery, murder, and, in general, a lawlessness difficult to reconcile with our notion that we had attained a rather high state of civilization.

It is the speaker's conviction that the more scientifically food and other fundamentals of civilization are dealt with, the better for the general welfare. Scientific treatment has developed more and more as the human race has aged and as it has gained individual and social courage by reflecting upon its own experiences. Pestilence, ascribed early to some irate god, later to some obscure but general corruption of the atmosphere, latest and now to the transmission from person to person of a minute but demonstrable causative micro-organism—pestilence will serve well to illustrate what I mean by the advance in scientific treatment that is so evident in our civilization of today.

Such advance we all know has not been uniformly distributed along all lines. The voice of the Dark Ages reaches us even in our homes, in the form of the senseless utterings of an astrologer broadcast over the "radio." That there is a demand for this medievalism is confirmed in the printing of such stuff and nonsense in the daily papers. Much dense and dangerous ignorance and much fearful superstition has persisted from ancient times, and flourishes side by side with intellectual bravery.

Our civilization is admittedly "science-centered." If it is to be measured against earlier civilizations resort must be had to some scale of values. For this purpose I know of no values better for such a scale than the values referred to as the values of *the Expectation of Life* (at birth). It is "the probable duration of the life of the hypothetical average individual." In the earliest Egyptian dynasties of which definite records have been found this expectation of life was not much over twenty years. In India today it is given as only about twenty-three years. True that deaths from snake-bite alone in India amount to 20,000 annually; but it is also true that "the Hindu peasant going about his work, has very nearly five times as good a chance to escape a cobra as the American citizen has to escape a motor car." In the United States in 1850 the expectation of life was considered to be about forty years, and today in this country it is placed somewhere between fifty-six and fifty-eight years. It is difficult to imagine a higher accomplishment of scientific progress than the prolonging of useful life. The Metropolitan Life Insurance Company in a study of the mortality statistics of 19,000,000 policyholders found for the first eleven months of 1930 (I speak from figures I read December 29, 1930) the best health conditions in United States and Canada ever known. This is a rich reward for efforts toward replacing the unproven by the demonstrable, and for using as a guide reason, instead of faith in tradition and folklore.

Even great progress is gradual and hence almost escapes us. Had we proposed to lecture upon bread pudding instead of ice cream, here in the halls of an institution of higher learning, it would have provoked laughter. For a member of the original faculty of this College to have offered to speak upon ice cream in the year 1821 would have been astonishing,—to put the matter mildly. But 1931 is not 1821. It may seem astonishing, but, in Pennsylvania State College, college classes in ice cream making have been given for the last thirty-eight years. Actually 291 mimeographed pages of titles of articles and books relating to ice cream were included in a bibliography of the subject published by the U. S. Department of Agriculture in 1926. By March, 1928, the output of the ice cream industry had grown to be worth over $400,000,000 annually.

Just how ice cream rose from the level of a kitchen product to its present plane is a story full of difficulties, for the term ice cream has in the past been used to name any one of a large number of different products. Certainly ice cream was tardy in bursting into print

in the best circles. Not until 1926 was there an indexed reference to it in the Encyclopædia Britannica. It appeared in the remarkable 13th edition of that work, which edition was "an entirely new survey of the march of events, the progress of knowledge and the innumerable changes of the world's aspects, thoughts, activities, in the years from 1910 to 1926." There is no indexed allusion to ice cream to be found in that great, interesting and generally useful device called the "New York World Almanac" until the issue for 1925. It is therefore a fair guess that something of exceptional interest and of importance happened to the ice cream industry between 1910 and 1925.

One thing that happened to ice cream in this period happened when sugar rationing began in this country during the World War. Ice cream was placed on the list of luxuries! This was probably an undistorted reflection of the layman's point of view, but among the initiated this classification produced a furor. So successful was the industry in proving to the Government ice cream has value as a food, that ice cream was removed from the class of luxuries and, as a food containing sugar, it was then placed among those things that could be manufactured. The child had grown to be a man without exciting attention outside of the immediate family; but now its manhood was officially recognized and made known far and wide.

For this child the days of infancy were hard ones. The early ice creams, containing, as they often did, eggs and custards at times masked under their tempting flavors outrageous abuses. We read in the third edition of George Newman's "Bacteriology and the Public Health," a book that in its day had a wide circle of influence, somewhat as follows:—In 1894 Doctor Klein had occasion to examine bacteriologically ice cream sold in the streets of London. In all six samples were analyzed, and in each sample the conclusions resulting were of a nature sufficiently serious to support the view that the bacterial flora was not inferior to ordinary sewage. The water in which the ice cream glasses were washed was also examined, and found to contain large numbers of bacteria. Some dozen outbreaks of disease have been attributed to the consumption of ice creams. A typhoid epidemic occurred in Liverpool (twenty-seven cases) in 1897 due to ice cream, and an earlier epidemic of the same disease traceable to the same cause occurred in Deptford in 1891 (Turner). Recently, a small outbreak occurred in the City of London affecting sixteen telegraph boys. The symptoms were colic and diffuse abdominal pains, headache, vomiting, diarrhœa, and nervous depression. . . . Doctor Klein examined

twenty-four samples of ice cream from the same locality, and found thirteen (or 54 per cent.) to be poisonous to guinea-pigs. The writer traced eighteen cases of typhoid fever in 1902 to the consumption of contaminated ice cream. Owing to outbreaks of this nature the London County Council (General Powers Act, 1902, sects. 42-45), has given powers for controlling this trade. . . . These regulations are new for London, though they have practically been in existence in Glasgow since 1895 and in Liverpool since 1898. . . . Ice cream usually contains vast numbers of bacteria.

An extended study (Fabian, 1926) has brought out about thirty-five epidemics of record, traceable to ice cream, one involving as many as 1800 people scattered over twenty-one counties, and some others very small. Nearly two-thirds of these epidemics were typhoid fever epidemics; the rest included scarlet fever, diarrhœa, intestinal disorders, diphtheria, and some unidentified illnesses. The list is long enough and the number of cases large enough to be quite impressive.

Just as an event of great importance, *i. e.*, the rationing incident to the World War, brought recognition to ice cream as a food, so some matter of importance must have converted it from the status of a potentially dangerous luxury to a sanitary and dependable food. Of this important matter, namely, pasteurization, which placed ice cream in a secure sanitary position, the general public is scarcely conscious. The lay mind has an indefinite idea, which is wholly erroneous, to the effect that all forms of life are as susceptible to destruction by prolonged cold as are the forms with which one is quite familiar. But experiment has shown that cultures of bacteria subjected to temperatures as low as —315° Fahrenheit are not killed, and that milk, meat, eggs, and other products kept in cold storage, may show a notable increase in the number of bacteria. It is the pasteurization to which manufactured ice cream is subjected that makes it safe as a food. The public is not aware that such heating has taken place, probably because the cooked flavor is not detected among the other flavors that characterize ice creams.

Pasteurization of an ice cream mix is carried out at a temperature that is amply high enough to kill the germs of typhoid fever, diphtheria, and even the more resistant germs of tuberculosis. It does thin appreciably the body of the mix, but this is offset later in the manufacture.

Since the date of the passage of the Federal Food and Drugs Act (1906), the growth of the ice cream business has been phenomenal. The average rate of growth between 1909 and 1926 was about fifteen million gallons increase per year. There can be no doubt of the beneficial indirect effects of the enforcement of food legislation; it reacts beneficially not only upon the consuming public but also upon the creditable manufacturers of food products themselves. An unnecessary and undeserved ill repute of any food product may thus soon be wiped out. The Act bears upon the colors and flavors used, upon the general wholesomeness of all the constituents, but not directly by fixed standard upon the sanitary quality of the product.

When Jacob Fussell, a Baltimore milk dealer, began (1851) to manufacture the first ice cream handled in a wholesale way in the United States, in order to use up his surplus cream, he probably little dreamed how soon this new business would be more profitable to him than his older milk business. By 1861, mechanical refrigeration became first a successful adjunct in commercial enterprises, and the manufacture and storage of ice cream on the large scale came within the limits of the possible. About the time the ice cream cone was invented, for it was first used at the World's Fair at St. Louis, *the homogenizer* was invented by August Gaulin of Paris. (Such machines are also known as viscolizers.) By this machine large fat globules are broken up into smaller ones, and particles of other constituents of the ice cream *mix* (as it is called) are all reduced very much in size and the thining due to pasteurization is more than made good. The product is of a much smoother texture than where the mix is not homogenized. Homogenization produces other results that are extremely important to the industry; it decreases the danger of churning the fat in the freezer and it makes possible the production of an ice cream with a desired and relatively permanent *overrun* under nearly all conditions of manufacture. Overrun is defined as the increase in volume per gallon of mix and is found by subtracting the gallons of mix placed in the freezer from the gallons of ice cream obtained, and dividing this difference by the gallons of mix placed in the freezer. These were among the most important uses of Gaulin's discovery in the ice cream industry, and they have contributed greatly to its development. The growth of the industry after these processes of refrigeration, pasteurization, and homogenization had been developed to meet its purposes has been enormous. In 1925 and 1926 mergers of the larger plants manufac-

turing ice cream occurred, and it is fair to say that today the manufacture of ice cream is an industry of very considerable magnitude. It is estimated (Rasmussen) that in 1930 Pennsylvania alone produced about 39,000,000 gallons of this frozen food.

Although it is usual to gauge the quality of dairy products by the bacterial count they show under certain standardized conditions, there is no Federal legislation or ruling establishing a bacterial standard for ice cream. The U. S. Public Health Service (Feb., 1929) has no model ice cream ordinance to suggest. The State laws referring to ice cream, where such exist, relate primarily to minimum standards for butter fat (cream) and for added substances such as colors, flavors, and for smoothing agents such as gelatin. Pasteurization of the ice cream mix is required by law in only a few States. It should be required everywhere, for it is well known that bacteria enter the product not only from the persons, vessels and implements in contact with the mix during manufacture, but also enter it with many of the ingredients, such as water, milk and cream, condensed and evaporated milks, flavors, dye preparations, as well as by way of accidental contaminations, etc. Each source of bacterial contamination can of course be carefully guarded by the manufacturer, but our experience is that some careful check up on the bacterial count of the product as offered for sale is a proper public health measure and leads quite promptly to an improvement in the bacterial quality of the local ice cream supply. Except where ice cream is produced upon the small scale, the producer already has mechanical means for properly cleansing and perhaps for sterilizing his vessels, and high bacterial counts are nowadays usually traceable to the condensed milk and to mixtures of it with cream, which the producer purchases. The caterers and the other small manufacturers or producers whose volume of business does not warrant the investment in such mechanical appliances as are really almost necessary in producing a bacterially satisfactory ice cream, are probably destined to be legislated out of the business unless they learn to improve their small scale processes with an aim directed toward higher bacterial purity of the ice cream they make. In the meanwhile the small producer may feel assured of his business only as long as the public continues to be guided by local prejudice and by texture, body, palatability, and (presumed) "freshness" of flavoring materials. Where ice creams have been scored consistently and throughout several seasons, as in the Pacific Slope Dairy Show of 1924 to 1926 inclusive,

the results show that there is no relationship betweeen the bacterial count and the factors mentioned, namely, texture, body, palatability, and flavor. Extensive investigation of ice cream plants and their products has shown that on the large scale it is easy to turn out the manufactured article with a bacterial count (on agar, at blood heat) of less than 100,000 per gram,—a count that compares closely with the maximum allowance in many places for the retailed milks. Where local authority has established a bacterial standard for ice cream, this maximum of 100,000 per gram has been the standard most frequently adopted. Required pasteurization of the ice cream mix is immediately in offing, and by some of us it is regarded as long overdue. It is some years since the Committee on Dairy Products and Eggs appointed by the American Public Health Association reported (1926) the need for nation-wide legislation requiring the pasteurization of the ice cream mix under control to be exercised by the local authorities where the ice cream is manufactured. The layman, although he will not admit it, is really at a total loss in his attempts to judge an ice cream by tasting it; "all is not gold that glitters," and all is not good that tastes good. There was a day in the sanitary control of drinking water when a confident farmer asserted that his horse knew when water offered to him was not fit to drink, and the farmer was willing to be guided for his own safety by this horse sense. So in the sanitary control of ice cream, there has been a day when the ultimate consumer relied confidently upon just as fallacious a test, namely, the test of his senses used while eating the ice cream. That day is rapidly passing. Science will here certainly replace ignorance and bias just as it has so largely done within the big ice cream factories of this country. When the ingredients of ice cream are taken in proper proportions, dairy products constitute from 80 per cent. to 85 per cent. of the materials from which it is derived; the layman has advanced far in his appreciation of the merits of scientific control of dairy products. He should now be mentally ripe for favoring local sanitary control of ice cream.

So far as the bacterial contributions of the constituents to the ice cream mix are concerned, the manufacturer can easily control some of them and with some effort can control all of them. The water can be heated, if necessary. The dry milk powder and the cane sugar have previously been sufficiently heated during their manufacture, so that they need merely to be stored dry and under good conditions. In the flavors, in the cold pack and frozen fruits and berries,

and in the coal dye preparations used, the bacterial counts ordinarily are low. Of course vigilance is called for. For example, vanilla beans may show high bacterial counts and some few preparations of dyes have been found to exceed all reasonable limits in this respect. The gelatin has to be watched closely, for the unsuspecting may at times purchase gelatin showing a count of upward of 100,000,000 per gram. But the gelatin, if controlled by law is allowed only up to a maximum of 1 per cent., and is usually much less significant in the matter of bacterial count of the mix than are the dairy products which make up about four-fifths of the mix. A factory turning out consistently a water ice (containing gelatin but no dairy products) with a bacterial count of only a few thousand I find may easily turn out at the same time an ice cream counting in the millions. Among the dairy products, creams at times show counts of several million, while evaporated milks and sweetened condensed milks may show figures well above a million per gram. Such dairy products are not bought for use by the careful ice cream manufacturer, but too frequently they are sold by jobbers to caterers, confectioners and other small producers of ice cream.

The bacterial count of the mix is reduced about 99 per cent. by proper pasteurization. Ice cream mixes are ordinarily pasteurized at a considerably higher temperature than that (143° to 145° F.) ordinarily used in the milk industry. A common procedure in pasteurization of ice cream mix is to maintain it at 150° F. for half an hour. Theoretically an ice cream counting 100,000 per gram could be produced from a mix counting 10,000,000 per gram; but this leaves out of account the influences of the many processes in manufacturing.

Just when the manufactured article, in excellent sanitary condition has almost reached him the consumer may fail to do his part. He often accepts the article served to him with a dipper freshly withdrawn from a rinse water of unsuspected and revolting filthiness. We have found these wash waters frequently in vessels of doubtful cleanliness, containing sometimes dead and living flies ("Bathing Beauties"!), and repeatedly showing bacterial counts well in excess of a million per cubic centimeter. Unless a dipper is wet a good deal of ice cream may adhere to it in an annoying way. But is this a sufficient reason for contaminating the surface of a good ice cream with a film of filthy water? If one could only peel dipped ice cream before eating it! Obviously, other things being equal, ice creams leave the factory and reach the ultimate consumer most safely in

original packages. Only this direct course gives the ultimate consumer assurance concerning the bacterial contributions that he may receive along with his ice cream. Those are wise communities that will enact local ordinances compelling all ice cream offered for sale in the streets and other exposed places by peripatetic or occasional venders, to be sold in original packages only.

Every step in the manufacturing processes except pasteurization may result in an increase in the bacterial count. *Homogenizing* the mix raises its bacterial count greatly (about 25 per cent.). This increase is commonly attributed to an assumed breaking up of clusters of bacteria and their separation more or less into individuals and into smaller clusters, each of which registers in the bacterial count as if it were an individual bacterium. One can readily imagine such a thing happening while a mix is being forced under an average pressure of about 2500 lbs. per sq. in. through an opening a few thousandths of an inch in diameter and between a hardened metal seat and a hardened metal block held against it by a powerful spring. Upon leaving the homogenizer, the mix may undergo *aging* for the purpose of further increasing its thickness (viscosity). Aging consists in holding the mix at some selected temperature between 32° and 40° F. for periods not usually exceeding seventy-two hours; when properly practiced it need not increase the bacterial count greatly. In the process of *freezing* there is a positive increase in bacterial count which is also commonly attributed to the breaking up of bacterial clusters by the beaters. The final process of *hardening* (to which the so-called "packing" of the home-made product roughly corresponds), which consists in storing the product from the freezer at a low temperature until much of the 50 per cent. or more of water yet unfrozen becomes solid, need not raise the bacterial count appreciably.

With respect to legal standards, most of which as has been remarked refer to the composition and not to the sanitary quality of the ice cream, the irrational lack of agreement and confusion commonly found among the statutes of the several states of our great Union obtains also here. Perhaps the diversity is as great as is the diversity in the divorce laws, or in the milk and cream acts. The forty-one or more states having ice cream Acts and the Federal Government severally fix a minimum legal percentage of butter fat (cream). By way of illustrating the paradoxes that may arise as a consequence of this lack of agreement, it may be stated that while plain ice creams (vanilla, coffee, etc.) within Massachusetts need con-

tain but 7 per cent. butter fat, no plain ice cream can go out of Massachusetts or any other state into interstate commerce that contains less than 14 per cent. butter fat. Those who are facetious may remark that this low standard in Massachusetts may represent a political effort to please its spinster population in the way of favoring a reduced female body weight.

In Pennsylvania the legal standard is 8 per cent. for plain flavors and 6 per cent. for fruit and nut ice creams. Yet the fact remains that all reputable firms manufacture ice creams that exceed considerably these legal requirements. The rationale of this is clear. Factory experience has demonstrated the impossibility of a highly satisfactory texture and palatability and overrun combined with such a low butter fat content, whereas competition in the trade rests largely if not solely upon texture and palatability, and profit rests largely upon overrun. Competition stimulates the production of a higher grade article than is asked for by law. It just happens that good business and a decent richness go hand in hand. Until some one discovers how to produce popular texture, palatability, and satisfactory overrun, when using only 8 (or 6) per cent. of butter fat, the industry can be counted upon to remain a model industry when contemplated from the point of view of the Pennsylvania ice cream act. Other frozen products not clearly labelled *ice cream* deserve no such encomiums, and anyone buying these frozen products will make no mistake in recalling that slogan of bygone trade, "caveat emptor,"—let the buyer beware!

From the scientific point of view, the ice cream industry is immature. For the present the manufacturer must be satisfied with an empirical solution to the problem of how to produce a satisfactory article at a satisfactory price. The answer to the question of how to produce the most satisfactory article of all at the least cost possible can not at present be given because of the present state of scientific knowledge. Milk is certainly one of the most complex affairs the scientist meets with in nature, and ice creams are made up largely of milk products (roughly 80 per cent.). In a melted ice cream we meet with a system composed in part of a true solution of both electrolytes and nonelectrolytes, composed in part of a partial solution and a partial suspension of both colloids and difficultly soluble salts, and composed in part of true colloidal solution and emulsion of colloidal solids and liquids and gases. A most important factor in the profit of any ice cream factory is the overrun. Getting a large

overrun that will persist throughout the period of hardening and until the time of delivery is really the problem of producing a relatively stable emulsion of butter oil and air. Emulsions are often most sensitive affairs. Jarring alone may cost the manufacturer much of his overrun, for the ice cream may thus lose much of its air and acquire a rough body much as a cake by jarring may become "sad." Small air cells give a stronger emulsion than large ones, and a greater number of air cells favor a greater concentration of the serum at the interfaces within this emulsion, and hence favor a greater stability. The specific gravity and the viscosity are influential factors in determining the size of air cell obtainable. The viscosity itself is an involved affair, which is the resultant of two viscosities, one the true or real viscosity due to the truly dissolved substances (solutes) in the water present, and the other the colloidal viscosity due to the submicroscopic particles suspended colloidably in the solution just mentioned. The resultant total viscosity is unquestionably influenced profoundly by the nature of the ingredients and their concentrations, by the manner of processing, and by temperature and time of aging. The solution that is responsible for the real or true viscosity is highly variable, changing as the temperature, agitation, and other factors change its concentration with respect to each of the several solutes. One of the least understood variables in this matter is the lactose (or milk sugar) which may cause a fatal defect called sandiness and which exists in two, if not more, different crystalline forms each with its own solubility and other physical chemical characteristics. The rates of transformation of one form of lactose into another and the rates of crystallization involved in the changes that continue to occur as the true solution cools are profoundly influenced by some of the colloids present in the mix. There are those who are informed as well as any who maintain that in an ice cream a true equilibrium among all the many chemical constituents and physical factors never is attained no matter how long the hardening period may be made. Probably all of the water present never is frozen in any commercial ice cream. Equilibria within the ice cream system and transformations within the ice cream system in so far as their velocities fall off with falling temperature can only be realized at extremely slow rates at the low temperatures used in the industry. It seems that today the knowledge necessary to deal satisfactorily with the ice cream system theoretically, as we deal with the simpler physical chemical systems that can at present be dealt with satisfactorily, is sadly inadequate.

I am tempted to use an analogy to help us in realizing the magnitude of the complete ice cream problem and in forecasting in general outlines the physical chemical aspects of this complete problem. There is some similarity between completely solidified ice creams and rocks that have crystallized from igneous magmas. There are senses in which, for example, a fine grained granite and a coarse grained granite correspond to a smooth ice cream and a rough ice cream. Both the granite and the ice cream are products of the cooling of a chemically complex mixture originally fluid; and in each an approach toward complete physical chemical equilibrium must proceed as best it can under the conditions in cooling. The ice cream problem is more difficult in a way, because the commercial product as sold is probably never a completely cooled and crystallized mass; some of the water in it probably never sets, and maybe would yield a less desirable product if it all did set. In the ice cream we know at first hand more about the original melt, while in the rock we know at first hand more about the final product. Crushed rock powders were first examined under the microscope about the end of the eighteenth century, and it has been over a hundred years since Nicol (discoverer of the Nicol's prism) prepared the first thin slices of mineral substances. It required many decades to create the science of petrology. Petrology has come into existence through years of intense and deep research by a large number of scientists of many nationalities and trainings and hence of many points of view. Besides these accomplishments those made to date by the ice cream industry seem but the beginning. The large expenditures that undoubtedly will have to be made in professional services and in laboratory equipment, the long tedious way of step-by-step progress through investigation, lie ahead. But unlike petrology, the science of ice cream has wealthy guardians and the prognosis is good. Studies of solubility and of crystallizations from supersaturated solutions, both in the absence and the presence of colloids, throughout the relatively narrow temperature interval concerned in ice cream manufacture, are easily conceived and certainly can be much more easily realized experimentally than corresponding studies in petrology. The transformations of lactose will yield their secrets, both as to form and as to rates much more readily than similar transformations that undoubtedly have occurred in the molten magmas that yielded the rocks we are thinking of. The temperature conditions under which the various rates of diffusion concerned in crystallization within ice cream can be advantageously

controlled will have to be studied and can perhaps be studied with relative ease. It is fair to presume too that the colloid elements that so complicate the problem can each be studied under controlled conditions. But, when, upon the basis of present-day statements, one attempts now to formulate tentatively the interrelations of quality in ice cream with the several variables stated to affect it, nothing but confusion results; in fact, some of the present-day statements are flatly contradictory and one must assume that significant factors have been overlooked.

But the outlook of the ice cream industry is rosy. Thanks largely to the scientific studies thus far made, a product of high sanitary quality and one that meets the taste of the purchasing public and the severe requirements of the sanitarian can probably be produced for years to come at such a profit that the industry will be financially equal to the task of working out the fundamental scientific details of its complete problem. We hail with justifiable satisfaction the humble kitchen product that has been raised through scientific progress to the level of a safe, staple food, excellent in quality and reasonable in price.

IODINE COMPOUNDS CONTROL SLEEP AND HIBERNATION—Experiments showing that iodine-containing compounds probably control sleep in man and hibernation in other animals were reported by Dr. G. S. Carter to the British Association for the Advancement of Science.

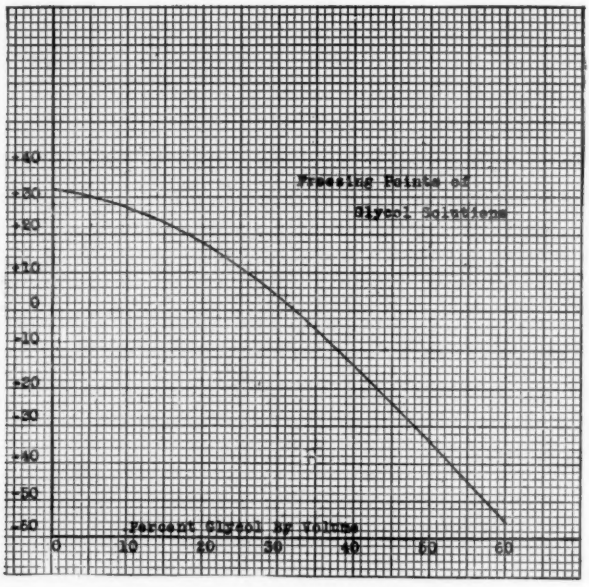
Dr. Carter experimented with hearts taken from frogs in winter and in summer. He found that thyroxin, which is the iodine-containing secretion of the thyroid gland, produced in the heart of the winter frog a curve of temperature and pulse rate typical of the heart of the summer frog. Other glandular substances did not have this effect. He concluded that the amount of thyroxin in the circulating blood controlled the hibernation of frogs and similar animals. Other experiments suggested that a similar rhythm in the amount or activity of iodine compounds in the circulation plays a part in the production of man's daily sleep.—*Science News Letter.*

THE REFRACTOMETRIC MEASUREMENT OF ETHYLENE GLYCOL TYPE ANTIFREEZE MIXTURES

By Ellery H. Harvey

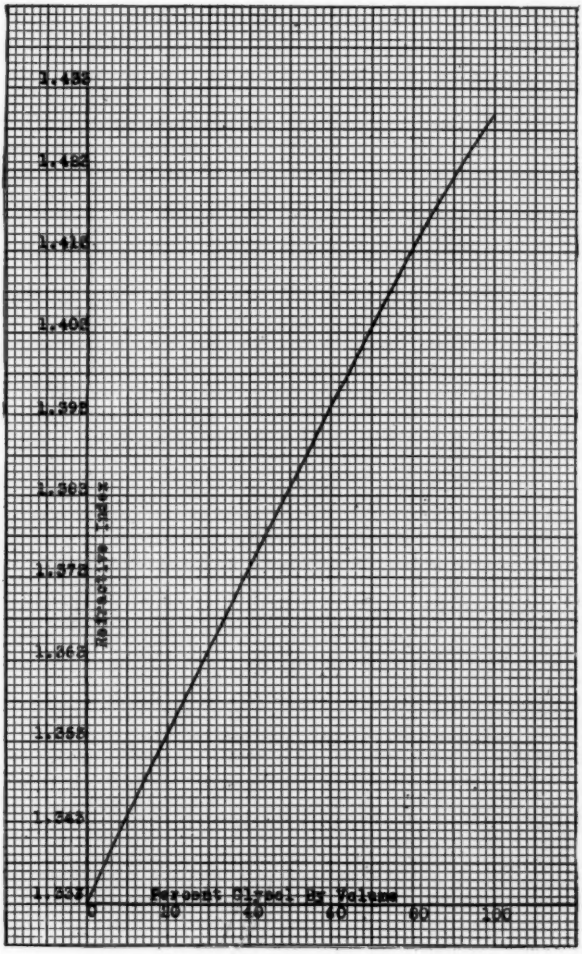
FOLLOWING its discovery by Wurtz in 1859 ethylene glycol remained an unimportant industrial chemical until its recent introduction as an automobile antifreeze. The relatively high initial cost is offset by possible re-use over a period of several seasons. This brings a flood of requests each Fall with the first freezing weather for information regarding concentration and recommendations for fortifying. We have found refractometric readings the most convenient and rapid, at the same time sufficiently accurate for the purpose.

Prestone, a brand of ethylene glycol antifreeze has been used to develop a table of refractive indices at varying volume-volume concentrations at 20°/20° C. The point at which crystals begin to form in such solutions has also been determined and reported in the table below as the freezing point in ° F.



Curve 1—Freezing Points of Glycol Solutions

Parts of Water	Prestone	Refractive Index 20°/20° C.	Freezing Point ° F.
9	1	1.3437	27
8	2	1.3540	17
7	3	1.3642	4
6	4	1.3745	—14
5	5	1.3845	—34
4	6	1.3943	—56
3	7	1.4038	
2	8	1.4130	
1	9	1.4220	
0	10	1.4298	



Curve 2—Refractive Indices of Glycol Solutions

For convenience the results have been plotted, making it possible by mere inspection of the curve to read intermediate points.

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ABSTRACTED AND REPRINTED ARTICLES

PROPOSED NEW FORMULÆ FOR THE BRITISH PHARMACEUTICAL CODEX*

By H. Treves Brown, B. Sc., Ph. C.

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IN CONNECTION with the revision of the British Pharmaceutical Codex the Pharmacy Sub-Committee have submitted recommendations to the Codex Revision Committee for the inclusion of many new formulæ and for important alterations in a number of formulæ of the 1923 Codex. In this paper an account is given of the experimental work carried out in the Codex Laboratory, on which are based new formulæ for the following preparations:—

Elixir Ephedrine Hydrochloridi

The pharmacopœial dose for ephedrine hydrochloride is ¼ to 1½ grains, and the Committee are of the opinion that the maximum dose should be contained in each fluid drachm. There was also a suggestion that the presence of a proportion of alcohol minimized the persistence of the taste of ephedrine when exhibited in a glycerinated syrupy vehicle. The following formula is based upon one suggested by a member of the Committee, and is a stable and palatable elixir in which the taste of the ephedrine is well masked:—

Ephedrine hydrochloride	4.6 gm.
Distilled water	83.3 mils
Glycerin	200.0 mils
Glycerin of saffron	50.0 mils
Spirit of chloroform	50.0 mils
Alcohol (90 per cent.)	125.0 mils
Tincture of lemon	50.0 mils
Syrup .....to	1000.0 mils

*Reprinted from the *Pharm. Journal.*

Glycerinum Bismuthi Carbonatis

Two formulæ are given for this preparation in the present Codex, one using bismuth nitrate and the other the subnitrate. The former compound is rarely found in pharmacy, and the Committee, considered it advisable to adopt for the revised Codex the formula employing bismuth subnitrate. In the formula the rate of addition of the bismuth solution to the ammoniacal solution controls the bulkiness of the precipitate, and in the course of experimental work it became obvious that the method was (i) too cumbersome for recommendation, and (ii) unlikely to yield uniform products.

After further consideration, the Committee decided that glycerin of bismuth carbonate should be prepared directly from the official bismuth carbonate. In an average sample made from the 1923 formula the volume of glycerin to be added to the moist precipitate for 1000 mil. of product was about 400 mil. The following formula was therefore accepted; it can be prepared in a few moments from materials readily available, and is identical with an average sample made from the old formula:—

Bismuth carbonate	500 gm.
Distilled water	500 mils
Glycerin .....to	1000 mils

Mix.

Glycogelatinum

Complaints have been made that the present B. P. C. basis for throat pastilles is too soft. Samples were, therefore, made containing a higher proportion of gelatin, and an increase to 20 per cent. yielded a more satisfactory product. The Codex directs that the gelatin be soaked in one and a-half times its weight of distilled water, and this was found to be a convenient quantity. If these same directions be retained for a new formula containing 20 per cent. of gelatin, a mixture of gelatin, water and glycerin weighing 1000 gm. would have to be evaporated on the water-bath to 734 gm. Not only would this be a rather tedious process, but at a later stage of the preparation there is added a quite dilute solution of sucrose and other ingredients in orange-flower water. By using undiluted orange-flower water at the later stage a great deal of the evaporation can be avoided. Further experiments resulted in the acceptance by the Committee of the following formula:—

Gelatin	200	gm.
Glycerin	400	mils
Sucrose	50	gm.
Citric acid	20	gm.
Sodium benzoate	2	gm.
Oil of lemon	1	mil
Solution of carmine	10.4	mils
Triple orange-flower water	62.5	mils
Distilled water ....to	1000	gm.

Soak the gelatin in one and a half times its weight of distilled water until softened, add the glycerin and heat on a water-bath until the gelatin is dissolved and the mixture weighs 850 gm.; add the sucrose, citric acid and sodium benzoate previously dissolved in the tripple orange-flower water, the oil of lemon, the solution of carmine and sufficient distilled water to produce the required weight. Strain through muslin and allow to cool.

Guttæ Physostigminæ

Eserine eye drops are at present prepared with the sulphate. The salt official in the new B. P. is the salicylate, and the monograph on this salt in the 1923 Codex states that its solutions do not become pink so readily as solutions of the sulphate. It was thought desirable to confirm this statement, and also to try the effect of boric acid in preventing coloration, although it is usually stated that the development of color is accompanied by little or no loss of myotic activity. One per cent. solutions of each salt, prepared with recently boiled and cooled water, were placed in completely filled bottles, and also in partly filled bottles, which were loosely corked; samples of each of these were stored in the light and in the dark. In addition to the solutions prepared with distilled water only, solutions of each salt were made containing also 1 per cent. and 3 per cent. of boric acid, and samples of these were similarly stored.

The general conclusions reached may be summarized as follows:—

(1) Boric acid has little or no effect on the sulphate solution, but the addition of 3 per cent. is a considerable improvement to the salicylate solution.

(2) In the dark, the sulphate alone is quite satisfactory, and equal to the salicylate with 3 per cent. of boric acid.

(3) In the light the salicylate alone is slightly better than the sulphate alone, but the salicylate with 3 per cent. of boric acid is much better than the sulphate, whether alone or with boric acid.

(4) In all cases the exclusion of air is advantageous.

It will be seen from the above results that the salicylate with 3 per cent. of boric acid is never less satisfactory than the sulphate, and in the majority of storage conditions is superior.

The following formula was therefore accepted by the Committee:—

Physostigmine salicylate	1 gm.
Boric acid	3 gm.
Sterilized water .....to	100 mils

The Committee were of the opinion that adjustments by means of salicylic or other acids to pH 2 to 3 were unsuited to a Codex formula, and that this optimum pH for preservation was too acid for eye drops. The 1923 Codex gives the solubility of physostigmine salicylate as 1 in 130; the new Pharmacopœia says that it is soluble in about 100 parts of water, and employs a 1 per cent. w/v. solution in two of the tests given in the monograph; the U. S. P. figure is 1 in 75, and Martindale gives 1 in 150. No difficulty was experienced in preparing a 1 per cent. solution for the above tests, using distilled water at laboratory temperature.

Linimentum Ammoniæ

The Committee were of the opinion that the nature of the oil used in this preparation taken over from the B. P. 1914 was of very little importance, the therapeutic efficiency depending on the presence of ammonia and the friction with which the liniment was applied. It was therefore decided to replace the two oils with liquid paraffin and oleic acid, and the following formula was found to yield a satisfactory liniment, which did not thicken, and showed only a small degree of separation after prolonged standing:—

Dilute solution of ammonia	250 mils
Oleic acid	25 mils
Liquid paraffin	725 mils

Mix the oleic acid with the liquid paraffin, add the dilute solution of ammonia and shake.

Linimentum Calaminæ

The thickening in this case is due to the formation of zinc oleate, and occurs more rapidly than with liniment of ammonia. Further, if a pharmacist does not use an olive oil of high acid value, he will experience difficulty, for the amount of calcium oleate formed will not be sufficient to ensure stability. Samples made containing liquid paraffin with 0.5 per cent. of oleic acid, and also with smaller proportions of the acid, were unsatisfactory; in no case was the product stable, separation occurring on standing at most for a few hours. The addition of wool fat was then tried. The product containing 2½ per cent. was found to be too sticky, but on reducing to 1 per cent. a satisfactory and stable liniment was produced. The final formula is:—

Calamine	45.7 gm.
Zinc oxide	34.3 gm.
Oleic acid	5.0 mils
Wool fat	10.0 gm.
Liquid paraffin	485.0 mils
Solution of calcium hydroxide	500.0 mils

Melt the wool fat in the liquid paraffin with the aid of gentle heat, and add the oleic acid. Gradually add this mixture, with constant trituration, to the calamine and zinc oxide previously mixed with the solution of calcium hydroxide.

Liquor Calcis Sulphuratæ

The formula of the B. P. C. 1923 was brought to the notice of the Committee because, on an order for the B. P. C. article, a solution containing 5 per cent. total sulphur was supplied. This was found to be stronger than had been obtained elsewhere, although inspection of the Codex formula would suggest that a 5 per cent. solution was intended. A sample of the solution was therefore made by boiling under a reflux condenser, assayed for total sulphur, and found to contain 3.4 per cent. w/v. Similar preparations of foreign pharmacopœias usually are made from higher proportions of calcium oxide to sulphur, with less water, and contain much higher proportions of sulphur.

It was decided that a total sulphur content of 5 per cent. w/v. should not be exceeded in a solution intended for medicinal use, and the following formula was accepted:—

Calcium oxide	25 gm.
Sublimed sulphur	50 gm.
Distilled water .....to	1000 mils

Shake the calcium oxide with an equal quantity of distilled water, add the sulphur and 500 mils of distilled water, and boil in a flask until the sulphur is dissolved; cool, filter, and pass sufficient distilled water through the filter to produce the required volume.

In view of the fact that very much stronger solutions are available in commerce, it was deemed advisable to include in the monograph a standard of from 4 to 5 per cent. w/v. of total sulphur, and also to give an assay process.

Liquor Quininæ et Strychninæ

This solution is used in conjunction with solution of ferrous phosphate for the extemporaneous production of Easton's syrup. The formula in the present Codex is of such a strength that 90 minims represents the alkaloidal content of 1 fluid oz. of the B. P. 1914 syrup. This strength has proved inconvenient in practice, and wholesale houses usually supply more concentrated solutions, which are eight times the alkaloidal strength of the syrup. It is not possible to prepare a solution of this strength, using phosphoric acid as solvent, even when due allowance is made for the reduced quantity of strychnine in the new B. P. formula, and it was therefore suggested that the phosphoric acid should be replaced by another acid. The use of another acid would render the solution ineligible for the preparation of Easton's Syrup, B. P., a fact equally applicable to the present B. P. C. solutions and to many supplied by wholesalers. It appears that there is a large demand for concentrated solutions for making the syrup, and it is probable that many pharmacists having only a small demand, will wish to prepare the syrup as required when such procedure does not conflict with the duty of supplying the B. P. product.

Samples made with nitric and hydrochloric acids were unsatisfactory, though a sample prepared with hypophosphorous acid was free from deposit after three weeks, but had become fungoid. It was decided, therefore, to employ this acid in a concentration of 6 per

cent. with sufficient glycerin (62 per cent.) to act as an efficient preservative.

The new formula for Liquor Quininæ et Strychninæ is as follows:—

Quinine sulphate	118.4 gm.
Strychnine hydrochloride	2.4 gm.
Hypophosphorous acid	60.0 mils
Glycerin	620.0 mils
Distilled water	to 1000.0 mils

Triturate the quinine sulphate and the strychnine hydrochloride with a mixture of the glycerin and 225 mils of distilled water, and the hypophosphorous acid and stir until the alkaloidal salts have dissolved. Then add sufficient distilled water to produce the required volume.

The quantity of syrup in 8 fluid ozs. of the new B. P. Easton's Syrup is very nearly 4½ fluid oz. Hence the following formula yields a syrup differing from the new official product only in the presence of 0.75 per cent. of hypophosphorous acid:—

Solution of quinine and strychnine	1 fl. oz.
Solution of ferrous phosphate	1 fl. oz.
Glycerin	½ fl. oz.
Distilled water	1 fl. oz.
Syrup	to 8 fl. oz.

The solution darkens on long exposure to air and light, but keeps very satisfactorily in the dark, and also in the light, if in completely filled bottles. The syrup prepared from it also darkens on being stored in partly filled bottles exposed to the light; it does not, however, differ in this respect from the new official product, but, unlike the latter, no deposit has formed, even on storing for three months. It may be added that the syrup prepared from the solutions, even when it has become discolored through unsatisfactory storage, yields a clear dilution with tap water.

Liquor Tolutanus

The compilers of the new Pharmacopœia have adopted syrup of tolu as the English title for Syrupus Tolutanus; they have also corrected the well-known error in the figure given in the 1914 B. P. for the weight of the aqueous solution before the sucrose is added. Syrup of tolu B. P. 1932 contains, therefore, 66 per cent. w/w of sucrose, corresponding to approximately 88 per cent. w/v. A syrup made by

diluting the B. P. C. 1923 solution contains only about seven-eighths of this, or 78 per cent. w/v. The deficiency could only be avoided if the solution contained 88 per cent. w/v of sucrose, but this is obviously impossible with a solution containing a substantial proportion of alcohol. Work was directed to modifying the formula of the 1923 Codex with a view to the inclusion of the maximum quantity of sucrose. Experiments showed that if the proportion of alcohol (90 per cent.) were maintained at 30 per cent., the maximum amount of sucrose which could be incorporated in the product was 50 per cent. A sample of solution of tolu was therefore made by adding the alcoholic solution of the balsam to the 350 mil. of hot distilled water; there was then no difficulty in filtering, and the preparation was completed by dissolving the sucrose in the filtrate. A syrup of tolu made from this solution is indistinguishable in taste and aroma from a syrup made from the present Codex formula, but it contains more sucrose, the actual content being about 84 per cent. w/v, compared with 78 per cent. w/v for the old preparation, and 88 per cent. w/v for the official product. The formula accepted is:—

Balsam of tolu	100 gm.
Alcohol (90 per cent.)	300 mils
Kaolin	100 gm.
Sucrose	500 gm.
Distilled water .....to	1000 mils

Dissolve the balsam of tolu in the alcohol, add the kaolin and 350 mils of distilled water heated to 70°, shake, allow to stand for twenty-four hours and filter; dissolve the sucrose in the filtrate and pass if necessary sufficient distilled water through the filter to produce the required volume.

The weight of balsam specified in the above formula, although the same as in the present Codex, is very much less than eight times the weight used in the official syrup. On the other hand, a syrup prepared from the liquor is more aromatic than the official syrup, although representing less than half the weight of balsam, and, in fact, a syrup prepared from 20 per cent. balsam was indistinguishable in flavor from one made with only 10 per cent. This result would seem to indicate that in the official process for syrup of tolu, in which the balsam is extracted with boiling water, more than half the aromatic principles are wasted.

[From the Codex Laboratory of the Pharmaceutical Society.]

BOOK REVIEWS

QUANTITATIVE CLINICAL CHEMISTRY; VOLUME II—METHODS —By John P. Peters and Douald D. Van Slyke. Baltimore: Williams and Wilkins, 1932. 957 pp. Price $10.00.

Volume II following the plan outlined in Volume I endeavors to present methods for the determination of those substances found in the body and its excreta which are of importance for clinical medicine and for the estimation of which suitable quantitative methods are available. Each chapter is prefaced with a discussion of the principles on which the methods are based.

There are 95 illustrations, including apparatus employed in determinations, charts, tables, etc. Chapter I covering 49 pages concerns general chemical technique, and chapter II covering 35 pages deals with special biochemical technique, and in both are to be found fundamental and valuable practical information needed by every laboratory worker. Chapter III covers information on analyses of gas mixtures; chapter IV on carbon dioxide and oxygen tensions in alveolar air; chapter V on respiratory metabolism; chapter VI on lung volume, and chapter VII deals with gasometric methods for analysis of blood and other solutions. Chapter VIII to chapter XXXII inclusive concern specific substances and their determinations in the body fluids or excreta, including methods for the determination of sugar; lipoids; total and and non-protein nitrogen; urea; urinary ammonia. amino acids; uric acid; creatin and creatinine; lactic acid; acetone, acetic acid and beta-hydroxybutyric acid; total organic acids; phenols; hemoglobin and its derivatives; proteins of urine, blood plasma and body fluids; blood volume; total base; sodium and potassium; calcium; magnesium; the pH of blood and urine; bicarbonate; titratable acid and acid-base excretion in urine; chloride; phophorus, and sulphur. In each of these last-named chapters the authors give the technique and describe all desirable methods which are available and applicable. There is included a gravimetric, titrimetric, colorimetric and a gasometric procedure when such methods were possible and available, and if advisable macro and micro forms are included. Occasionally (as

in the gravimetric determination for sugar) one type of analysis may have been omitted due to the fact that the authors felt that such technique offers at present no methods able to compete in convenience or accuracy with current procedures of other kinds. The principle of grouping in one chapter all procedures described for the determination of a given substance has been violated somewhat insofar as they concern gasometric methods. Many of the latter are found in one chapter devoted to such determinations. An appendix of 33 pages is included and in here are to be found procedures which though not strictly within the scope of quantitative analyses as outlined above they are nevertheless required and requested so that their inclusion is desirable and a valuable addition. These are methods for renal and hepatic function tests; a semi-quantitative estimation of bile pigments in blood plasma; determination of blood urea clearance; and other methods not available when the original text was prepared.

A bibliography (giving detailed references) at the end of each chapter reveals the sources other than the authors' wide experience from which the information given has been obtained. This alone makes the volume a valuable reference addition to the library of any laboratory worker, but other than this, there is a debt of gratitude due the authors for this work. It is to be highly recommended to clinical laboratory workers as a most helpful and necessary publication which should be in their possession. It is difficult to see how one familiar with laboratory technique and procedure will feel able to do without this volume after once seeing it.

It is unfortunate that some (however too many for a W. & W. publication) typographical errors appear due to careless proofreading. This does not however detract from or destroy the value of this book.

Louis Gershenfeld.

HISTORY OF PHARMACY THROUGH THE AGES—Dr. L. Reutter de Rosemont. (Taken from the *Bulletin de la Federation Internationale Pharmaceutique,* translated by Mrs. Amelia Mesa Ponce.) Paris. J. Peyronnet Cie., Editors. Vol. I, From ancient times to the 16th

century, 605 pages. Vol. II, From the 16th century to the present day, 660 pages.

This work, "History of Pharmacy," is a book of international importance which not only describes pharmacy as a trade and profession in any determined country, but of its evolution in the whole world. It enables one to make comparisons, while many historical works appearing in Germany, Holland, Hungary, Sweden, Norway, etc., can only serve to investigate the evolution of pharmacy in its own country, excepting, perhaps, Hermann Schelenz' "Geschichte der Pharmazie," at present the best general history of pharmacy and one which conscientiously declares the origin of its bibliography.

The "History of Pharmacy" in the first part, regarding ancient times, shows us how the real pharmaceutical science has evolved from an empirical study of medicine. The first chapter treats of the medicine used by the Israelites, the Phoenicians, the Assyrians, the Egyptians, the Hindus, Greeks and Romans, where the baths and perfumed oils play an important role. Later on pharmacy as practised in the convents and by different religious orders in Europe in the Middle Ages is taken up. Meanwhile the Arabian knowledge from the Orient had been introduced, also that of the School of Salerno and other scientific institutions.

Next we have several interesting chapters relating especially to the evolution of pharmacy in France up to the 17th century; followed by a chapter on the magic, superstitions and the alchemy of that age.

The second part of the volume commences with the biography of noted pharmacists, pharmacologists, botanists and chemists of the 17th century. It gives outlines of the pharmacopœias, dispensatories, formularies and books of antidotes of those times and speaks of the laws and regulations in force with respect to the practice of pharmacy not only in the cities, but throughout the country. French sources have been consulted here; the description of the evolution of the systems of grants in Germany, Austria, Sweden, Norway and other countries is missing in this work.

Similar data has been compiled regarding the other countries in the 18th and 19th centuries. We will find there descriptions of the influence of various scientific personalities in pharmacy, the legisla-

tion which regulated the practice of the profession, and the by-laws regulating its study in Europe. Much of the data of modern times is incomplete and antiquated. Accordingly it says that in Holland, the course in pharmacy is carried on at the University for only a three year period, while it is certain that that period has been doubled; that the inspection of pharmacy is made by the Provincial Medical Committees, and, since 1902, legislation has entrusted this mission to Inspectors; that each hospital possesses its own pharmacy, a thing which could be considered among the desirable but not among the realities.

In the last chapter of this second part it speaks about the censorial drugs, a topic that does not fit at all in a History of Pharmacy.

Moreover we might add that these two books are abundantly illustrated with reproductions of pictures from ancient books, etc., and that we consider that this work of Dr. L. R. de Rosemont will occupy a place in the library of all those interested in the History of Pharmacy.

J. J. Hofman.

"Wellcome" Photographic Diary, 1933—The 1933 edition of this ever-popular Exposure Calculator, Handbook and Diary is now available.

The tables of exposure and developing factors for plates and films have been revised and, when necessary, corrections and additions made. These tables, which involve much labor in the testing of plates and films, place in the hands of photographers at a very low cost, the results of expensive and laborious tests by experts independent of any trade considerations, and present speed factors from the user's point of view.

It has been found possible to include new matter dealing with the processing of amateur cine films and the production of fine grain negatives, to allot more space for records, yet to retain all the valuable features of previous editions. Amateur cine enthusiasts will find much to interest them in this edition. There is a comprehensive list of cine films available for amateur use with speed and development

factors. The depth of definition table has been enlarged to cover apertures from F1 to F22.

This Handbook provides essential information and data not elsewhere readily obtainable and should be a part of the equipment of every photographer.

The "Wellcome" Photographic Exposure Calculator, Handbook and Diary is intended for pocket use; it is therefore always ready for instant reference. Memoranda pages are provided to enable personal records to be made of exposures, subjects, etc., on the spot, and the Diary pages can be used for general records if desired.

Four editions are issued: Northern Hemisphere and Tropics; Southern Hemisphere and Tropics; Australasia and Tropics, and United States of America.

The price is 75 cents per copy.

HANDBOOK OF PHARMACOGNOSY—By A. Tschirch. 2d ed., issue 11, 101 pages, 11 illustrations. Publisher, B. Tauchnitz. Leipzig, 1932; paperbound, appr. $2.00.

In this new issue of the well-known monumental work, Professor Tschirch of Berne, Switzerland, and Professor E. O. von Lippmann of Halle, Germany, discuss the building stones of the history of pharmacognosy. The first chapter treats in a general way with the knowledge in prehistoric time and as recorded for primitive people.

In the subsequent 7 chapters detailed reference is made to the drugs used, according to early records, by the people of Egypt, Sumer (in the south of Babylon), the Semitic people: Babylonians, Hebrews, Syrians and Arabs, the Arish race—people of Indian and Persia. Finally, the people of China, Japan, and of Greece.

References to recent publications testify to the thoroughness with which the revision is carried out. The striking photographs, depicting early records, are welcome additions. Various lists as those of plants and drugs (with native names), used by the Hebrews of the one, enumerating 398 identified drugs with the Chinese names, should prove very valuable for reference. The fact of identity should stimulate research in materia medica of those people, ancient and living.

Even one who is not historically inclined, will be greatly entertained and profited by the comprehensive treatment of the historical phase of crude drugs here presented.

Arno Viehoever.

THUMB-NAIL SKETCHES III—JOSEPH JOHNSON (1776-1862). By J. Hampton Hoch.—Dr. Joseph Johnson was a prominent physician and historian who occupies an unique position in relation to American pharmacy. Born in Mt. Pleasant, near Charleston, S. C., on June 15, 1776, Joseph was the fourth son of William and Sarah Nightingale Johnson. The father was one of South Carolina's early and spirited patriots who was exiled to St. Augustine, Fla., upon the British capture of Charleston. When an exchange of prisoners was effected at Philadelphia in 1781, William Johnson was there reunited with his wife and children, the boy Joseph then being but five years of age. After living for a short while in the Quaker City, the family returned by slow stages to their South Carolina home.

Joseph received his early education in local schools and later at the College of Charleston, showing remarkable talent for the classical languages. Following his preparatory studies he again journeyed to Philadelphia, this time to attend the medical lectures at the University of Pennsylvania. Upon the successful conclusion of his studies he was awarded his M. D. degree (1797), his graduating essay being "An Experimental Inquiry into the Properties of Carbonic Acid Gas or Fixed Air."

Immediately after returning to Charleston, Johnson, in partnership with Dunlop, bought the drug and apothecary business of Dr. Elisha Poinsett. On August 14, 1797, they advertised for sale "1000 lb. Soccotrine Aloes, 300 lb. East India Rhubarb, 400 lb. Jalap, 50 lb. Ipecacuan, 2500 lb. Peruvian Bark (pale), 800 lb. Ditto (red), 400 lb. Quick Silver, 300 lb. Nitre, 1000 lb. Litharge, 300 lb. Rochelle Salt, Dutch and English Phials, Norris' Drops, Glass's Magnesia."

A zealous worker for the common weal, Joseph Johnson was a member of the committee of the Medical Society of South Carolina that organized and planned (1801) a public dispensary. As president of the Medical Society he reported (1809) to the Massachusetts Medical Society, after examining their pharmacopœia, that "They agree with you that a Pharmacopœia calculated for the practice of the United States would, if practicable, be highly advantageous, but in proportion to its advantages would be the confusion and mischief arising from numerous works of this kind.

"A perfect Pharmacopœia is still deemed a desideratum by this Society, and to obtain the concurrence of different States in the formation of a general work of this kind they, with deference, recommend that the different Medical Societies, at a future day, be requested to refer such a compilation to someone of the learned Medical Associations: That the association preferred should nominate certain persons to complete the desired work, and that the profits arising from it should be the perquisite, individually, of the gentlemen thus nominated, as an encouragement and compensation for their time and attention. Should this recommendation be a subject for future consideration, the difficulties and objections may then be explained or the plan modified to render it agreeable."

Dr. Johnson's active interest in pharmacy undoubtedly heightened his conviction as to the need for a truly national pharmacopœia—a conviction that culminated eleven years later in the first U. S. P. convention. When plans for a general convention to form a national pharmacopœia were finally promulgated by the New York Medical Society in 1817, he was chosen by the Medical Society of South Carolina as its chief representative.

The following year, 1818, he served on the first American board of pharmacy to examine and license a pharmacist, thereby once more working as a pioneer in the advancement of pharmaceutical practice.

Joseph Johnson died in Pineville, S. C., on October 6, 1862. Fortunately he lived long enough to see the two fields of pharmaceutical endeavor in which he had scattered a few seeds bear a good harvest after careful cultivation by hands other than his.

THUMB-NAIL SKETCHES IV—THE FIRST AMERICAN BOARD OF PHARMACY. By J. Hampton Hoch.—The Medical Society of South Carolina when petitioning the Legislature for incorporation (1793), asked for censorial powers as the College of Physicians and requested power "to examine the qualities of Drugs kept for sale in the shops of Apothecaries. To condemn such as are unfit for use; and to punish persons vending medicine so condemned." Although the charter was granted (1794), the legislators did not extend the police power sought. But the Society was instrumental in having an act passed, December 18, 1817, which stated that "no apothecary shall be permitted to vend or expose to sale any drugs or medicines without previously obtaining a license to do so from the Medical Society of South Carolina or Board of Physicians" and that the boards "shall have the power to examine any apothecary who may apply to them for a license, touching their (sic) knowledge of drugs and pharmacy, and on finding such person qualified, shall grant such license."

Mr. Richard Johnson applied to the Medical Society on April 1, 1818, for permission "to keep a druggist's store." One month later the Society granted him the license "to pursue the business of druggist," but did not examine him until December 14. At that time a committee of the Society met and Mr. Johnson was "examined by Dr. Finley on the definition of Chemistry and Pharmacy; by Dr. Carandessez on the preparation of Phosphate of Antimony and Tartar Emetic; by Dr. Joseph Johnson on the preparation of Mercury and Phosphorus; by Dr. Greenland on the doses of Laudanum, Tartar Emetic, Ipecac, and Fowler's Mineral Solution of Arsenic; by Dr. Joseph Johnson (again) on the mode of making the common plaster and on mixing the Ol. Ricini with water."

We infer that the candidate successfully passed the examination, for there is no record that his license was revoked.